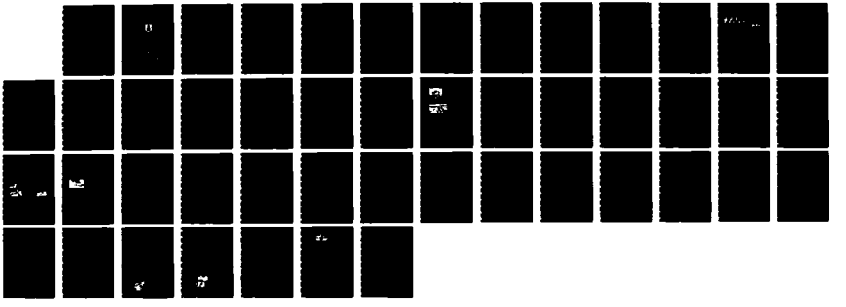
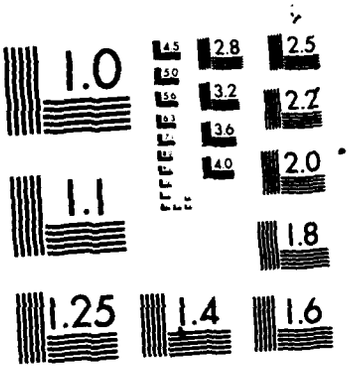
AD-A172 740 MODERNIZATION (SELECTED ARTICLES)(U) FOREIGN TECHNOLOGY 1/1
DIV WRIGHT-PATTERSON AFB OH Q XIAOHAO ET AL 18 SEP 86
FTD-ID(RS)T-0629-86

UNCLASSIFIED F/G 5/9 NL





(2)

FTD-ID(RS)T-0629-86

FOREIGN TECHNOLOGY DIVISION

MODERNIZATION

(Selected Articles)

AD-A172 740

DTIC FILE COPY

Approved for public release;
Distribution unlimited.

HUMAN TRANSLATION

FTD-ID(RS)T-0629-86 18 September 1986

MICROFICHE NR: FTD-86-C-002208

MODERNIZATION (Selected Articles)

English pages: 42

Source: Xiandaihua, Nr. 2, 1986, pp. 14-21.

Country of origin: China
Translated by: FLS, INC.
F33657-85-D-2079
Requester: FTD/SDBS

PREPARED BY:

TRANSLATION DIVISION
FOREIGN TECHNOLOGY DIVISION
WPAFB, OHIO.

TABLE OF CONTENTS

GRAPHICS DISCLAIMER

All figures, graphics, tables, equations, etc. merged into this translation were extracted from the best quality copy available.

THE MODERNIZATION OF EDUCATIONAL TRAINING METHODS

Qingquan Xiaohao

The Obvious Trend In The Development Of Modern Military Educational Training

In a peace time environment, educational training is the source of a troop's fighting power. How to raise the level of modernization of educational training methods has gained more and more attention and concerns by the military services of every country in the world. Due to a prolonged peace period, the national defense budget of every country is consistently being reduced. But as scientific technologies are progressing rapidly and are being extensively applied in the military domain, weapon systems are being improved continuously and their power and accuracy increased almost daily. The structure of these systems has become more and more complicated, and their costs are driven higher and higher. If traditional methods with all real equipment and live ammunition are used to conduct military educational training, it would be far beyond the financial and material resources of any country's military establishment. Therefore, in order to solve the problem of using the least funding, yet producing highly trained

troops, every country's military services are concentrating on and putting efforts into improving training methods. According to reports, the military of the U.S., Soviet Union, Britain, Sweden, West Germany, etc. have invested heavily in the reform of educational training methods. Their investment guidelines are: (1) to exert all-out efforts in researching and developing simulation equipment for training, and developing audio-visual teaching programs; and (2) to concentrate in building modernized joint tactical training centers. The training methods adapted by the Owenberg National Training Center of the U.S. use the "Millers" multi-functional laser battle training system which can estimate the "real-time" casualties to conduct simulated live battle exercises, and use remote-controlled targets to conduct live ammunition target practice. The West Germany's "Talisi" tactical training battle simulator system is another example. Owing to the extensive utilization of these training simulation equipment, there have been quantum jumps in the quality of military educational training for these countries. In the mean time, it reduces attrition of equipment and waste in finance and materiel. Therefore, through the economic analyses of military policy, the Western European countries have put heavy emphasis on developing training methods and increased the fundings for research and manufacturing of simulation equipment for training every year. In the next five years the fundings could reach 1 billion U.S. dollars. The United States has spent an enormous 4.5 billion U.S. dollars in simulation equipment for the five-year period from 1979 to 1983. Army Secretary John Matthews, Jr. of the Reagan Administration pointed out in an article published in October 1982 that one of the training methods for the U.S. Army in the 80's was to adapt battle simulation equipment, and it was an important

way to increase the effectiveness of a troop's battle training. Currently, every nation in both NATO and the Warsaw Pact adopts simulation equipment as a troop's standard equipment. For every piece of weaponry installed, there is also a corresponding simulator installed. There are even cases where simulators are first installed long before the installation of certain new weapons. In conclusion, continuous development of the domain of simulation applications, research and manufacturing of simulation equipment for training and raising the standard of modernization of training methods have become the obvious trend in the development of military educational training for every country in the world.

The Central Military Committee is very concerned about establishing modernized educational training methods for our military services. Under the situation of tight finance and reduction in national defense budget, it has appropriated special fundings for the research and manufacturing of simulation equipment for training. This has provided very favorable conditions for establishing modernized educational training methods for our military services. Therefore, although our development of simulation equipment for training started rather late, the pace has accelerated in the past couple of years. There have been breakthroughs not only in the scientific technological level of equipment, but also in the development of multi-layered and multi-faceted characteristics of the equipment.

New Concepts In The Modernization Of Educational Training Methods

The general definition of modernization of educational training methods. Scholars of different countries, even those in the same country, now all have their own opinions, and they are far from being unified. We believe that the general definition of modernization of educational training methods can be comprehended from both a broad and narrow sense. In the broad sense, it means the surface characteristics of the common trend in the development of military educational training methods of each country in the world, and these surface characteristics are the progresses obtained from and the developmental direction demonstrated by the world's new technological revolution in the domain of military training methods. Therefore, it is an international concept. It is the average standard of the world's developed countries, not the highest standard. In the narrow sense, it means the new level in the development of educational training equipment. The modernization of educational training methods is still a concept which contains changes. In a different time period, as the economic structures of different countries change, it correspondingly takes on a different meaning. In this context, it is also a concept with a time limit. The modernization of educational training mehtods that we are talking about uses the period of the 80's and violent changes become the time limit. The decision on the reform of the economic system by the Central Committee of the Chinese Communist Party pointed out that: "the new technological revolution currently underway in the world is a new opportunity and challenge for the development of our country's economy. This requires that our economic system possess a strong capability to absorb contemporary new technological achieve-

metns, to promote progress in science and technology and to create new productivity." No matter what angle you take to comprehend the modernization of educational training methods, it should at least include the following three points:

First, the modernization of educational training methods represents a type of progress for the development of military educational training. The modernization of educational training methods that we are talking about is the modernization under the condition of a current world new technological revolution. For our military services, the so-called modernization of educational training methods does not simply mean to abandon the traditional training methods and, disregarding the objective conditions, blindly pursue new technology and a new level. It means to selectively inherit the basis of traditional training methods while molding it with modernized aspects and then proceed with new creations.

Second, the modernization of educational training methods is the systemized developmental direction of educational training. It is a set of training development. It includes the organizational mechanism, training methods and training equipment, etc. It can therefore be said that the modernization of educational training methods is also system engineering. As to the development of modernization of educational training methods, it can be studied and investigated from the aspects of technology, management, location, funding, human resources, etc.

Technology means the developmental standard of modern military scientific technology and the extent of its effects in the domain of educational training.

Management means to manage, organize, plan, control and process effectively the fundings, materiel and scientific research work required to realize the modernization of training method.

Location and funding are not only the specific subjects of scientific management, but also the indispensable factors for educational training. Their significance needs no further explanation.

Human resources are the central driving force in the realization of modernization of training methods. Because only through human activities can new training methods exert influence on every aspect of educational training, and thereby obtain the desired effects.

Third, the modernization of educational training methods is a developmental process. From the dynamic point of view, it is a developmental process moving from a traditional sense to a modern one. At a certain period when the training of a certain piece of equipment has been completed or after the goal of modernization of a certain training method has been reached, there will be new items appearing with still more modern characteristics. The equipment that has already been "modernized" becomes, in a certain sense, traditional and outdated, and there is need to pursue new and more modern items. It is exactly this process of constant pursuit of "modernization" that makes the educational training methods progress continuously.

Tactical maneuver training simulation system at corps headquarters.

The realization of modernization of our military educational training methods is the response to the world's new technological revolution. Simulation training has had a developmental history of over a century. In modern days, due to the rapid development of science and technology, it has evolved from single technical maneuver training simulation to battle simulation participated in by all military branches. It incorporates the newly developed science such as control theory, artificial intelligence, model identification, computer and microelectronics technology, graphic processing, communication networks, laser technology, fiber optics, etc. and continuously explores new domains for applications. It can be observed that the primary direction of science and technology revolution not only determines the direction of quality change in the basis of material technology for the armed forces, but also determines the direction of quality change in the military educational training methods.

Therefore, the new technological revolution is a new opportunity and challenge to the development of our military educational training methods. We must grab the opportunity and selectively jump over certain technological development stages while adopting certain new technological achievements and utilizing the structural adjustments of educational training methods by the advanced countries as well as the fierce competition between countries in order to develop our military training method as quickly as possible. In the meantime, we also need to learn from the experience and modern management methods of the technologically advanced countries and adapt new technological means to accelearate the reform and innovation of our military educational training methods. Only by grabbing the opportunity to respond to and meet head on the challenges of the world's new technological revolution and by adopting active measures, from the strategic view of accelerating technological progress and promoting the development of training methods, then can we gradually shorten the distance between our military educational training methods and those of the advanced countries. We cannot afford to close our eyes and ears and be blocked from the new trends in the world's development. We must not idle and miss the great opportunity, otherwise the goals of modernizing our military educational training methods and building an integrated modern army will never be realized.

To realize the modernization of educational training methods is to adapt to the needs of strategic transformation in the governing thoughts of our military build-up. It must be pointed out first that the Military Committee is determined to build our armed forces into a modern army with Chinese characteristics, and the realization of

modernization of educational training methods is an important component in reaching that strategic goal. Our armed forces' modernization process includes weaponry, combat commands, combat types, educational training, administrative management, etc. The modernization of educational training is dependent upon, checked, and influenced by its relations with other aspects. The modernization of educational training methods is the condition and basis for the realization of modernization of educational training. Without advanced educational training methods it will be rather difficult to train the troops into possessing higher educational training quality. Therefore, if there is no modernization of educational training and its methods, our armed forces' modernization process will be directly affected. In addition, the Military Committee has made the decision to reduce the total number of troops by one million. The number of troops is reduced but the combat duties reamin the same. We must intensify educational training and raise the level of modernization of training methods in order to build our armed forces into a lean but versatile army. Implementation has proven that using modern simulation equipment to conduct training cannot only conserve man power, materiel and funding, but more importantly, it can also conduct accurate quantitative analyses of the factors that make up fighting power and the major relations between the opposing sides. It allows lifelike simulation of military actions which otherwise are either not permissible or difficult to conduct in real life. It can better demonstrate the confrontationality and spontaneity of combat activities between the warring parties. It can test the extent of influence to combat effectiveness by a certain factor. Therefore, we can use a simulated combat environment to conduct lifelike battle training, thereby rais-

ing the quality of educational training and the fighting power of commanders at all levels, command posts, and everybody in the rank and files. Therefore, the modernization of educational training methods is an important aspect of our armed forces' modernization process. To realize the modernization of educational training methods is to adapt to the urgent needs of strategic transformation in the governing thoughts of our military build-up.

SPECTACULAR SIGHTS IN THE HISTORY OF MILITARY TRAINING - A REPORT ON A TACTICAL COMBAT EXERCISE CONDUCTED USING LASER AND ELECTRONIC SIMULATION EQUIPMENT

Zhao Zhongfan, Li Shuanqin and Liu Sehua.

On a late fall day in 1985. At the foot of Mt. Yan, an unprecedented spectacular sight in the history of our military training unfolded before people's eyes: in the sky and on the ground, the offensive side and the defensive side, real equipment versus real equipment, real troops versus real troops, guns and rifles firing loudly, colorful smoke bellowing. The tanks were hit one after another, the soldiers were "annihilated" one by one. Victory or defeat on both sides can be clearly seen.

This was not the filming of a movie on location, nor was live ammunition fired. This was a battalion level tactical combat exercise conducted by a certain mechanized division of the Shanyan Military Region using laser and electronic simulation equipment of various light and heavy weaponries developed by the Shenyang Military Region Simulation Equipment Research Institute.

This was not a real battle, yet very much resembled one with bloodless fighting.

Appearance Complete And Spirit Present

Against a bristling fall breeze, this reporter followed various training experts onto the reviewing stand.

Displayed before people's eyes was a vast area of rolling hills. Thick brown weeds trembled under the fall breeze. Occasionally a few chirrups from bugs of the fall could be heard. It was in these silent hills where two groups of troops equipped with laser and electronic simulation equipment lay low - one posing as a "red army" reinforced tank battalion, the other as a "blue army" reinforced motor infantry company, and they are about to engage in a face to face combat.

Bang! Bang! Bang! Three red flares went up into the sky. The battle curtain was thus drawn open.

Suddenly two silver-gray fighter bombers and two dark green armed helicopters from the red army appeared and, as fast as a wild tornado, dived toward the positions of the blue army.

This was the Air Corps conducting a surprise attack. The position guide told people that there were laser simulators installed on the anti-aircraft guns, machine guns and guided missiles on the ground as well as on the airplanes in the sky. They could fire laser beams within the respective weapon's effective range. The aiming maneuver

procedures are the same as those for live shell firing. Smoke would be emitted to indicate a direct hit. No sooner had the guide stopped talking than both sides started exchanging fire. An armored vehicle and an anti-aircraft gun emitted yellow smoke. They were hit by the laser on board the airplane. Of course, the Air Corps also paid the price. One of the airplane was hit by the anti-aircraft laser. It flew away with a red smoke tail trailing behind.

Casualties caused by live ammunition were the main concerns in joint ground-air exercises in the past. Combat could only be conducted according to preset time and air space. Targets were placed quite a distance from the site of the exercise. Since air and ground forces did not have common combat targets and there were no threats of ground fires, the effects of the joint exercise were not good. Many pilots, though having participated in numerous exercises, still did not really understand how to coordinate with ground forces in combat. Now, live ammunition had been replaced by a laser, and the roadblock to air-ground coordination had been removed. An airplane was exposed to the threat of a ground laser at all times, thereby forcing the pilot to practice seriously and create special maneuvers.

No sooner had the sky of fierce air battles been silenced than the earth started to shake - the artillery battle had started. This reporter, through television monitoring equipment, saw the howlitzer and mortar positions of both the red and blue armies in the distance. The commander crisply gave orders and the gunners briskly aimed and fired. But, no shells were seen fired. "Now, the shell is in flight." The position guide explained as he waved a small "package", and then

he proceeded to solve the puzzle in people's minds. It turned out that the gunners on both sides were using intermittent aiming, electronic simulation firing equipment to fire simulated shells of electromagnetic pulses. The system is suitable for artillery firing training and technical combat exercises. This set of equipment is presently the first one developed in our country. It also enjoys a leader status abroad.

As the guide talked, clouds of smoke bellowing one after another could be seen at the front edge of the blue army position and the line of movement of the red army. Tanks and soldiers on both sides were being hit by electromagnetic pulses.

Seeing this view, an "old timer" artilleryman next to this reporter could not help but exclaim: "This is a remarkable change! With this set of equipment, the difficult problems in joint training of the artillery and other military branches have been resolved." Indeed, hampered by the killing power of live shells, the status and effects of artillery in joint training were never demonstrated in the past. It was either firing, with back to back, "over the mountain high lob" or maneuvering empty guns. To designate the point of explosion required manual detonation of dynamite bags. Such face to face real stuff had never been seen before!

Under the cover of artillery fire, the tanks and armored vehicles of the red army had positioned into battle formation while advancing ahead. They roared and charged the front edge of blue army positions.

But the roads laid ahead were not smooth.

The blue army had set up multi-layered anti-tank crossfire. There was a dense anti-tank electronic mine field and technologically advanced anti-tank guided missile laser firing simulators. In the trenches at the front edge of its position and at the pivotal point of positional depth there were tanks, armored vehicles, recoilless guns and bazookas all equipped with laser simulators and hidden under camoulflage. It could be described as traps within every step and danger everywhere.

Through the "battlefield" monitoring system, this reporter heard the tank battalion commander give his order. He called in long range artillery to provide fire support, and two guided missile launchers of the blue army were "scrapped." He ordered the tanks to conduct concentrated bombardment in order to cover the anti-tank guided missile platoon that followed to secure its launching positions. Beams of laser simulating guided missiles cut through the sky toward the armored targets of the blue army. One moment he ordered the tanks to guide the infantrymen to charge; the next moment he ordered the infantrymen to pass the tanks, charging to destroy those hidden anti-tank bazooka gunners.....

The laser receiver in the soldier's helmet releases colored smoke indicating a hit.

Colored smoke comes out of the tank indicating a hit.

"Soft Command" Stiffens

"Train the soldiers based on how the battle is fought". This slogan, which has been stated for years, is now really being demonstrated in this laser combat exercise.

There was a small commotion in the spectator stand as the red army's First Tank Company, which served as the primary attack force, passed through an open area. Look, some of the tanks charged at high speed, some stopped for a short while to "fire" and others even started to weave left and right like a "dragon swings his tail". The equilateral triangular battle formation and, with the same

throttle opening equal speed movement usually seen in previous tank exercises was gone.

What had happened? This reporter would like to ask questions and would not stop until the answers were found. By coincidence, there was a well-informed person next to this reporter. He said that battle formations looked good in tactical training, but their impracticality was an old shortcoming. The First Tank Company did not escape from this mold at first. When the red and blue armies exchanged fires for the first time and the First Company moved into battle formation, several opportunities to stop for a short while and commence firing were passed up just to maintain good formation. As a result, the formation was maintained all right, though barely, but tanks were hit by the blue army's anti-tank weapon laser and "smoked". The First Tank Company suffered heavy losses in this battle and was beaten badly. It appeared that laser combat was almost like real fighting, and tactics must be considered. Thus, the company commander and comrades adjusted the governing thoughts of training to let the needs of the attacking enemy dictate the formation. Tactical maneuvers like alternating high speed charge, firing while in motion and stopping for short while to fire as well as evasive driving were combined to display the spectacle which we saw earlier.

Infantrymen assumed the leading role as the battle moved deep into the enemy position. As the soldiers charged, they moved, took cover, aimed and fired fast. Sand bags and sharp ridges were being utilized skillfully. They crawled low, made fake movements, and rolled forward. These successive and highly difficult combat moves

were enough to blur one's vision. A small squad even waded through knee-deep mud water in order not to be detected by the enemy. The reason they all fought so brilliantly could also be attributed to the laser. In the past many people thought tactic training was "soft command" and exercises were like plays. Once laser combat simulators were being used, the rank and files were unexpectedly forced into their active roles all of a sudden, thereby greatly raising the quality of training.

A Lively "Chess Game"

This unprecedented exercise was like a Chinese "chess game". "Zu River" and "Han Border" separated the opposing sides. The rank and files of both armies gave all they had trying to "eat" the other side. Looking through a pair of binoculars this reporter saw the defensive setups within the blue army position, and it was hard to tell which was real, which was fake. The red army Third Tank Company, serving the duties of assisting the attack, suddenly encountered fierce enemy fires as it started attacking the defensive depth of the blue army position. The blue army charged toward the red army like a hungry tiger charging for its food.

The company commander in the red army command vehicle ordered the infantrymen to get off and cover the tanks. Using favorable terrain features, they fired back head on to suppress enemy fire. Gunners for guided missiles, anti-tank guns and machine guns circled around to attack the flanks. This series of maneuvers at once changed the situation of the red army and made decisive effects on the taking

of No. 3 position.

In the No. 4 position of the blue army, this reporter followed two bazooka gunners of the Ninth Company and witnessed their remarkable ambush. When the red army tanks approached the front edge of the position, they came out from the hidden trench and circled around to the flank exposing the front deliberately. As the tanks stopped to fire, they fired bazookas from the flank unexpectedly. Within a moment, two red army tanks started to smoke heavily. When the red army tanks in the back started to fire in retaliation, they had pulled back to the main position safely following a predetermined route.

The blue army lost the last hills they had defended. The second wave of the red army reached the enemy position at the top of the main hill. As three green flares rose into the sky and the observers had hardly had a chance to breathe freely yet, a report sheet clearly printed with losses and casualties on both sides was already handed to everybody. The sheet recorded data of ammunition consumed, number of casualties, equipment losses, etc. in which region under what conditions. The electronic remote sensing and remote control system was used to officiate this exercise. Battle field conditions such as casualties, weapon losses, etc. in the exercise were displayed instantly through the use of a computer. At the end of the exercise, the results of both sides were clearly shown immediately.

A deputy commander of this exercise told this reporter that the use of light instead of bullets and electromagnetic pulses in place of shells not only were safe and reliable, but also greatly saved the

expenses on ammunition in a tactical exercise. Just take the anti-tank guided missiles for instance, a real missile could cost as high as 50-60 thousand dollars or as low as 20 thousand dollars. A laser simulation shell only cost less than a fraction of this number. According to statistics, a total of more than a thousand rounds for each type of shell were fired in this exercise. If real shells had been used, the expenses would have been very large. Since laser shells were fired, only a few thousand dollars were needed. Come to think of it, what a big saving this was!

True, war leads to bloodshed. However, if we fully employ the modern simulation equipment and treasure the peace time to effectively conduct bloodless combat training, then would not less blood be shed in future battlefields?!

Photographs by Duan Jiwen

A GENERAL DESCRIPTION OF THE DEVELOPMENT OF OUR MILITARY TRAINING SIMULATION EQUIPMENT

Since the 70's, with the fast development of scientific fields such as electronics, microelectronics, laser technology, etc., one after another every advanced country rapidly developed its military training simulation equipment. Various models of training simulation equipment based on computer, microprocessor and laser have been developed and they come out as numerous as bamboo shoots after a spring rain. They have been extensively employed in various weapon training and troop tactical exercises for every branch in the military services. Implementation has proved that the training simulation equipment is a very effective tool in troop training and the domain of modern military research.

The development of our military training simulation equipment, though started quite late, has progressed rather quickly in recent years and some have reached an international advanced level. Judging from the exhibit of military training simulation equipment held in 1985 and the laser and electronic simulation combat exercises, our military training simulation equipment has evolved from appearance

and mechanical simulation to computer, laser and electronic simulation; from technical simulation to tactical simulation; from single military branch simulation to coordinated tactical and combat command simulation; and from ground battle simulation to naval and air-ground joint battle simulation. By preliminary statistics, there are more than 400 types of training simulation equipment including those that are already in use and those that will be in use in the entire military services.

Simulator Based On Computer

The heart of this type of simulator is a computer or microprocessor. The development in this field has eliminated the need for many mechanical devices required by the electromechanical simulator. Especially the use of microchips has made a big step toward the miniaturization of the simulator.

Weapon Training Simulator. Computerized simulator uses the arithmetic and logical functions of computer to quantify combat principles, environmental conditions as well as troops, weaponries, command control and efficiency factor. It then describes the entire process of the combat activities using a simple mathematical model. They include a weapon training simulator and more sophisticated simulators for battlefield command, control, communications, intelligence systems, and electronic warfare. The corps headquarters tactical combat training simulation system, for instance, is established on an IMB-PC-AT microcomputer using applicable computer

languages. The hardware includes mainframe, CRT, printer, graphic input, etc. The software is composed of a main program and graphics, interference, command, etc. thirteen subroutines. This system cannot only be used to conduct man - machine combat practices, but also man (enemy) - man (us) combat practices to allow personnel under training to obtain lifelike combat experience. There are others like the corps combat training microprocessor simulation system, the Fast Simulation - 1 indexing simple battle simulation system, the 82-I ground artillery firing command simulator and the submarine torpedo attack training simulator, etc.

82-I Ground artillery firing command simulator

F-7 Take-off and landing flight simulator

Maneuver Simulator. Maneuver simulators include simulation in ground maneuvering, aircraft maneuvering and ship maneuvering. These simulators have become more and more advanced, accurate and specialized, owing to the technological development in computer and microelectronics. The simulator can accurately display the movements of vehicle, tank and aircraft ranging from the most basic two-dimensional movements for aircraft. It could also simulate, with amazing accuracy, different ordors and various minor differences between various

vehicles and aircrafts. This means no surprises of any kind for the personnel under training, thereby shortening training time and raising effects of training greatly. The JMG-1 tank advanced maneuver simulator, the HL-II naval maneuver simulation trainer, FB-5 aircraft instrument flight simulator and the F-5 aircraft-carried instrument flight simulator are examples of the subject simulator.

FB-5 aircraft laser receiver component bay

Maintenance Simulator. Troops equipped with such high-tech systems like tank, artillery, guided missile and aircraft have contributed to the advent of computerized maintenance training simulators. The computer can reproduce, in a controlled manner, possible malfunctions of various weapon systems. After the student makes corresponding maintenance measures, the computer will then process and evaluate. The BDP-II horizontal mobile mechanism malfunction indicator and the electrical maintenance techniques training platform are examples of the subject simulator.

The extensive application of computer-based training simulator will certainly cause tremendous development in computer software

technology including the standardization of program input and the application of program input and the application of high level languages.

Laser Simulator

Even since its advent, the laser has been actively employed in military simulation training. The development started from the ruby laser simulator of West Germany in the 60's to the He-Ni laser simulator and semiconductor laser simulator of today. The single soldier combat laser simulator, the joint tactical combat laser and electronic simulation systems, etc. of our military, due to their unique features, have broken our traditional method of real-rifle-live-ammunition target practice and our "acting" style tactical exercise. These simulators put the troops under lifelike tactical training and demand fast responses to the abruptly changing situations in the joint warfare of various military branches. They make the troops capable of conducting combat commands and field maintenance training under any terrain conditions.

From now on we must strive for a major technological breakthrough. The development directions are: first to raise the degree of fidelity and effectiveness of simulation. The newly developed technologies such as opti-electrical display, computer graphics, automatic control and microelectronics will certainly gain more extensive applications in the new simulation equipment such that better simulation fidelity and effectiveness are obtained; second to develop toward the serial, standardized and combined direction in order to raise the generality

of components and even the integral equipment system.

(Xiaohao)

ROOTED DEEP IN THE FERTILE LAND AND GOOD EARTH
- AN INTERVIEW WITH DIRECTOR LI ZHENGYI OF THE SHENYANG MILITARY REGION INSTITUTE OF TRAINING SIMULATION EQUIPMENT

Zhao Zhongfan

This reporter met with the "diehard reformist" Li Zhengyi, who is famous throughout all the military services, in the exercise field at the foot of the ancient great wall. A short while ago, a certain unit of the Shenyang Military Region had used the very electronic and laser simulation equipment which were successfully developed and produced by the institute under his leadership to conduct an unprecedented tactical combat exercise. In this exercise the substitution of bullets with light and shells with electromagnetic pulses had been fully implemented for dozens of weapons ranging from the airplane and guided missiles in the sky to tanks and artillery on the ground to the rifles and hand grenades in the hands of soldiers. It had shortened the distance between training and reality and turned a new page for the modernization of training methods. This feat was highly praised by the Military Committee and the chiefs in the headquarters.

However, we still had a few "riddles" after watching the exersice why has such a small institute established for less than two years and

located in a remote valley been able to obtain, one after another, so many scientific research achievements and still come up with so many new ideas? Why are those projects that could not be completed by scientific research units with more technical resources, yet are completed by this institute? Why is the success rate of their research projects so high, and most of them can be implemented in the military.....

Having heard our series of questions, Li Zhengyi smiled and said: "It looks like I need to hold a press conference". Without waiting for our answer, he continued: "The reason why the ancient Greek mythical hero Anty was so powerful was because both his feet stayed in contact with mother earth. If we claim to have achieved a few results in the research and manufacturing of training simulation equipment, it is also, first of all, because both our feet stand on the firm ground. In the past we could not compare with other institutes in terms of funding and technical capability. But we enjoy a unique advantage; that is, we are near a mechanized military unit and have maintained close ties with them. Starting from 1973, we had been a reform group affiliated with this unit. The institute was established in 1984 and we did not move into tall buildings in a big city. We stayed close to this unit."

"What you are saying is that you have combined the institute with the military unit. But what are the advantages of this?" Li Zhengyi answered positively:" There are, of course, many advantages. As you know, the most important aspect of scientific research is the selection of reseasrch topics, also known as 'ideas'. But where do these

ideas come from? You cannot just imagine them, nor should you rely on instructions from the top management. They must be obtained from personal experience. We deal with training equipment; therefore, we should not be separated from the implementation of training in military unit. The personnel of our institute periodically join the unit in exercises to observe the implementation of training and maintain a close relationship with the troops. We not only understand their needs, but also absorb their wisdom. Therefore, as their weapon equipment is being constantly renewed, we will always have a constant supply of new topics." At this point, Li Zhengyi started to recount with ease the fifty or so pieces of training equipment developed and produced by them since 1973 and the historical relations of training implementation with the military unit - they first made plaster concrete training shells for bazookas, and the fact that every soldier could only fire one real shell every year contributed to this. The reason they were then determined to make a tactical combat laser firing simulator was because they found out that the unit's basic training consumed much ammunition; the weapon suffered heavy attrition; and the tactical combat training was not lifelike - it was like acting and far from reality. Many specific items such as electronic hand grenade, electronic mine, laser receiver for commander and radioman stemmed from ideas suggested directly by the rank and file of the unit.

Li Zhengyi added: "In addition, through our close contact with this unit, we heard and saw many shortcomings caused by the backwardness of training methods. This presented a sense of uargency for reform. Also with the easy access to resources ranging from equip-

ment to personnel supplied by this unit, we were able to smoothly overcome various diffculties and greatly reduce the cycle of time required for design, testing and final production."

As Li Zhengyi talked excitingly, two nonuniformed men, who looked like intellectuals walked over to him and asked him questions concerning machine testing. After they went away, we asked: "Director Li, how come there are local technicians in the institute?" Li Zhengyi smiled: "This is exactly the second question I was about to answer - the question concerning technical capability. Just like fresh flowers not only need peat, but also rain and sunshine, scientific research follows the same rationale. It must not only closely relate to practicality and plant its roots in the military unit and the people, but must also open doors and windows to widely absorb new technologies and new knowledge. We must constantly replenish ourselves so that the scientific research work can be like fresh flowers which bloom contantly without withering. Therefore, we started a second union; i.e., the union of this institute with scientific research organizations within and outside the military as well as certain related factories. With this union, our small institute can take on big tasks even though we do not possess all the required resources."

So, this institute was originated from a reform group. Though with many good features, it also has inherent shortcomings: heavy emphasis on small scale production. Some comrades like to play "small but complete" and try to do it all. They become upset when they see names of two units appear on the scientific research performance report. Once they were working on a "bazooka automatic wind

adjuster". The design was quite scientific. But some comrades did not cooperate with the factory when it was time to make a sample. They tried to make it themselves using a sanding machine and files. After exerting great efforts, the sample was finally completed. However, since the technology used was outdated and the precision did not reach the requirement of original design, the sample had to be scrapped.

Li Zhengyi concluded after he finished talking about this lesson: "In fact, science is without borders. All advanced things, whether they are developed in or outside our country, should be the fertile land and good earth that nurture us."

The subject was changed to the exercise we had just observed and Li Zhengyi introduced: "The electronic and laser simulation equipment presented to the Military Committee and chiefs in the headquarters included a total of eight major systems, dozens of models and thousands of components. The forty or so personnel of our institute were in charge of six major systems. From the time we received the assignment to actual design, testing, production and installation, less than a year had passed. What did we depend upon to accomplish such tough scientific research duties within such a short time? Other than our own abilities and hard work, we depended upon the strength of other scientific research organizations in and outside the military as well as factories. Our guideline was that if we were capable of handling the overall design and that even though we were a little weak in the specific design and technical skill areas we would do it. Because as long as the techniques are available in our country we could gain access to them through joint venture,

cooperative contract or a visit to learn and be able to convert to our own use. This is the road toward socialized large scale production for scientific research work."

Li Zhengyi then told us that the electronic and laser simulation equipment they developed this time was made possible by establishing technological cooperation relations with about two dozen scientific research units in and outside the military and factories, and thereby cracking many technical problems which were difficult to solve within a short period of time relying only on individual resources. For example, the projectile firing weapon electronic combat simulation system involved technologies in computer, opti-electrical angle measuring instrument, electromagnetic receiver, etc. At that time they lacked technical personnel in these areas. Would they dare to take on this task? After a detailed analysis, they found that these areas were all common technologies and to some automation research institutes these were not difficult problems. Thus, they boldly accepted this task. They contracted several scientific research units and factories with the right stuff and successfully completed the task. This realized the breakthrough from training simulation equipment for straight firing weapons to those for projectile firing weapons. A blank has been filled.

"Of course", Li Zhengyi switched: "Cooperative efforts and borrowing other people's strength should still be based on oneself. If one does know much about modern technology, or is blocked from information like people living in the Shangri-La, then large scale production is out of the question. Therefore, we put heavy emphasis

on learning new knowledge, new technology and new information. We not only have trained experts in laser electrical circuitry technology like Bai Yumin and experts in machining technology like Chen Yanzhong, but also attracted a group of computer and automation "majors" from some highly reputable institutions. Though we are located in the mountains, we are not blocked from information. We have an intelligence room that is filled with information and we have hired five "top guns" from around the country specializing in intellignece, mechanics, software and hardware as our technical advisors. In addition, everyone in our institute possesses the revolutionary spirit of hard working even to the point of giveing up sleep and forgetting to eat. Armed with these virtues as the base, we have the capital to conduct cooperative projects with other organizations. We then have the courage to take on big tasks."

Our third question mark was erased by Li Zhengyi with just a few words. He said: "The reason why basically our scientific research projects since 1978 have produced no scraps and have been able to complete one, then put it to final production and then apply it to the military, bears no secret. We insist on one principle: "the military has a use for it, can repair it and can afford it." Oh, it still comes back to planting both feet on the ground. "So, we have always combined facing the future and facing new technology with facing reality, and we operate within our means."

Troops which participated in the exercise were about to come down the hills. Before ending the interview, we asked Li Zhengyi to talk about his future plans. He thought for a while and told us: the goal

for 1986 is to develop from a consolidated base and to make the pace of reforming training equipment match that of our military equipment replacement, thereby contributing our efforts again toward the modernization of our military training methods. While they prepare to organize strength to improve and perfect existing electronic and laser simulation equipment, they also prepare to widen the development and strive for developing more training simulation equipment.

As he talked, a smile of confidence surfaced on Li Zhengyi's face. Influenced by him, we felt excited. Oh, Li Zhengyi, you are always so ambitious. Oh, the star of scientific research rises from the valley. We wish you to rise higher and brighter. In the meantime, we also hope you will never separate from the arms of mother earth.

Heading by Yongdong

A NEW GENERATION OF TRAINING SYSTEM
- AN INTRODUCTION OF THE U.S. ARMY NATIONAL TRAINING CENTER

Located in Owenberg area in the Mojave desert region is a large U.S. Army training facility with the most lifelike effects thus far - the U.S. Army National Training Center. It mainly teaches troops, as combined forces of air-ground joint combat troops, how to fight against lifelike threatening fortes in exercises that are extremely close to real battle. The training center occupies an area of 64,200 acres and is well equipped; troops for training and troops acting as the enemy are regularly staffed. It is capable of displaying sophisticatd and lifelike battlefield conditions and environments as well as simulating various enemy combat maneuvers; it can conduct battalion level live ammunition firing, combat exercises and "air-ground in one" coordinated battle exercises.

Live Ammunition Firing Range

The training center has two major ways of conducting lifelike training: the first one is utilizing the "Meyers" multi-functional laser combined combat system capble of estimating "real-time" casualties to conduct simulated combat exercises; the second one is

utilizing remote-controlled targets to conduct live ammunition firing exercises.

The live ammunition firing range is 68 kilometers long and its widest section measures 25 kilometers. The range is long and narrow in shape and is located in the northeast part of the training center. It is primarily used for live ammunition firing for light weapons, tanks, direct fire support and mobile weapons. It is equipped with 1,018 computer-controlled moving targets which are capable of simulating the attack of a motorized enemy infantry battalion. If the attack of a reinforced motorized enemy infantry battalion is simulated, a total of 165 vehicle targets and 61 human targets can be setup in the seven-sections whithin the distance from 380 to 4,000 meters in front of the defense line. These targets move up and down sequentially at fixed time intervals making them appear, to the defense troops, to be the enemy approaching at a speed of 12 km/hr. The timing for destroying vehicle targets can be set by the time required for destroying real tanks. Human targets can be placed inside vehicles; they could also be placed at locations where the infantryment might get off from the vehicles.

All the targets and explosion indicating devices in the range can be manually carried and they can be either remotely controlled or use batteries as power sources. A cannon fire simulator can be connected to each armored vehicle target and will emit white smoke upon instructions. When the target is hit, it then emits red smoke. Human targets can be raised upon instructions and lowered automatically when hit. These armored vehicle targets and human targets are equipped with

explosion indicating devices to simulate defense troops fire from a distance. The entire targets position is controlled by eight radio transmitters, and through them enemy losses can be accurately understood.

Monitoring System

At the beginning of the battle, tanks move toward the enemy position. A red tank fires at a blue tank. A black line quickly appears to indicate the trajectory of the shell; the blue tank is hit and immediately it is enclosed by black boundaries indicating that it has been destroyed. This view is not a simulation exercise conducted indoors. It is a real tank combat exercise with situations of the battle field displayed on the phosphorescence screen of the television monitoring system.

This kind of television monitoring system is composed mainly of television monitor, computer, microwave communications antenna, camera, video recorder, sound synthesizer and transmission device. Through the use of this system, every action of the participating troops (or portion of troops) can be monitored and recorded. Vehicles equipped with the multi-functional laser combined combat system (i.e., the "Myers" system) can also be traced and monitored. The "Myers" system simulates live ammunition firing through its transmitter. If the laser hits a fatal point of the vehicle, the vehicle is considered "destroyed" and its " Myers" system out of service. As a tank fires, the " Myers" system sends signals to the computer. The computer, in turn, displays the trajectory of every shell to let the

analyst understand the tank's location, firing time, type of weapon used, distance from target and firing results. If a high resolution black and white television camera equipped with a 900 - 4,100 mm variable focus lens is installed in the exercise field, then it can cover 99% of the areas in the exercise field, and its effective range can reach 25 kilometers working day and night.

In conclusion, there are four ways for the monitoring system of the training center to collect the troop's training information: the first one is audio information. Through the large volume of audio information monitored and recoded by 40 radio networks, events which occurred in the exercise and the reasons why they happened are collected; the second one is video information. Through the use of one stationary video camera installed on the top of Mt. Taft in the National Training Center and eight mobile video cameras, the video tapes recorded live are fed into the computer system in order to fully understand the true process of the exercise; the third one is digital information. Through the central equipment of the training center - the computer system records a large volume of information such as firing, direct nits, number destroyed, etc. which is constantly being transmitted back from about 500 pieces of training equipment at every stage of the exercise. This is the main source of exercise information; the fourth one is written information. Based on the reports on combat situations written by the 30 or so observers or referees who are assigned to each troop, along with other information, a combined, a combined report titled "Master Materials to Studied after Returning to Station" is prepared and given to the participating troops at the end of each rotating training period. A copy is also sent to the

Joint Military Research Center.

Intelligence and Counter-electronics

In order to protect the activities of troops that are being rotated to receive training, the training center has a military intelligence company organized by the military intelligence battalion. Said company includes a ground monitoring radar platoon, a counter-electronic platoon, a liason platoon and a maintenance platoon. It is equipped with two AN/TRQ-32 and three AN/PPS-5B radars.

The Intelligence and Counter-electronic Security Group. It is an important component of the military intelligence company and a rapid response communications networks. Its primary duties include proposing suggestions to the upper commands and coordinating the operations of the military intelligence company so as to ensure that the company can effectively exercise its functions. In general, the intelligence obtained by the intelligence and counter-electronic security group must not be withheld for 15 minutes during enemy attack; 30 minutes during our attack. Yet, the upper commands must inform the group immediately of major tactical maneuvers so that it can relocate with proper timing.

The Ground Monitoring Radar Platoon. Said platoon has great values to the troops that are being rotated for training at the national training center. The ground monitoring radar can be used to identify the enemy defense pivotal point and the enemy troops or weapon targets in front of the front edge of our defense line during night battles; it can assist our troops to penetrate smoke screens, or guide our night patrols as well as monitor enemy attack routes, our own flanks, obstructions such as trenches and mine fields. One of the most important duties of the ground monitoring radar platoon is to assist special contingency troops in countering enemy ground reconnaissance means.

The Counter-electronic Platoon's Combat Squad. It is in charge of commanding and managing counter-electronic operations. It serves as the radio network control center of the platoon. It has to maintain constant communication contacts with the intelligence and counter electronic security group and all units under the counter-electronic platoon. Therefore, it must be stationed at locations where good communication effects can be obtained.

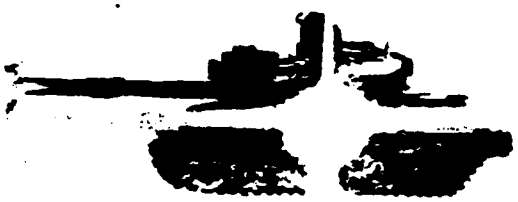
The Radio Monitoring Group. Said group's main duty is to provide intelligence, which is the primary content of its operation, and give direction to the operation of the military intelligence company. The intelligence it provides can be directly used in identifying the most important targets, and finalizing counter-electronic operations and targets for sensing radio directions.

The Radio Direction Sensing Group. Successful radio direction sensing combined with intermittently aimed firing can make the enemy lose their ability to launch attack. duties of direction sensing is the extension of radio monitoring activities. The direction sensing systems are all pointed directly at enemy radio stations. They should not be installed in front of any land objects that can reflect radio waves because even a slight interference will produce errors in the direction line readings.

The Counter-electronic Group. This group is commonly known as the "fighting power reinforcer". It can disrupt the electromagnetic frequencies used by the enemy. The counter-electronic group is installed on highland with good visibility and convenient approaching roads.

The Secret Coding and Counter-intelligence Group. It has important functions at the training center. The acting enemy troop has two intelligence units: the contingency unit which can conduct reconnaissance or carry out commando duties; radio-electronic warfare unit has tne capability to conduct radio monitoring, direction sensing and counter-electronic duties. It can also provide the protection of

ground monitoring radar for the acting enemy.



The cruel wars in the past have created a group of outstanding commanders and soldiers. However, for potential future conflicts, people will use every available means to fight, survive and win the final victory.

(Zhong Xun)

END

11-86

DTIC